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(54) Ring radiator for loudspeakers.

(57) A ring radiator for a loudspeaker has an annular inner portion (24) and an annular outer portion (22) and a tubular former (24*c*) carrying a coil (28) and positioned at the junction of said portions. Instead of securing the former to the radiating element by a butt joint the former is here made integral with at least one of the portions (e.g. 24*a*, 24*b*) of the radiating element. If integral with just one portion of the radiating element, the wound component is then secured to the other portion (22), preferably by an adhesive lap joint.

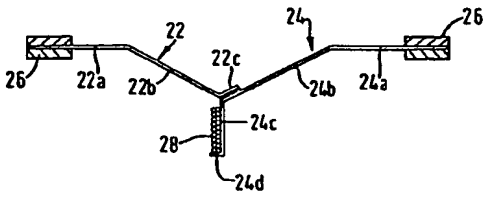

FIG. 2.

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RING RADIATOR FOR LOUDSPEAKERS

SPECIFICATION

This invention relates to an improved construction of loudspeaker which incorporates what is known as a ring radiator. Loudspeakers which incorporate a ring radiator have an annular diaphragm which is held clamped at both its inner and outer peripheries and which is vibrated by the movements of a coil which is coupled to the diaphragm.

One conventional construction of ring radiator for a loudspeaker comprises a diaphragm element formed as an annulus having generally horizontal inner and outer webs and a substantially V-shaped valley zone between them. The inner and outer webs are rigidly clamped by support washers. A separate tubular former carries the coil windings. Conventional practice has been to secure the wound former to the apex of the valley zone of the diaphragm by means of an adhesive using a butt joint. In order to improve the adhesion, the tubular former is sometimes provided with a tongue to provide an increased surface area for adhesive contact with the diaphragm.

This conventional form of construction has a number of disadvantages. Firstly, it is a relatively fragile construction, relying as it does upon a butt

joint to secure the wound former to the diaphragm. Secondly, with this form of construction the former has to be wound first with the coil, and this delicate combination then has to be brought up to the diaphragm and secured thereto. This involves handling problems and the possibility of damage to the components. It is also not easy to wind the coil on to the tubular former. Furthermore, it has also been found that with this form of construction the response characteristics often include undesirable resonances, primarily due to poor coupling between the coil and the diaphragm through the butt joint.

It is an object of the present invention to provide an improved ring radiator for a loudspeaker, and also an improved method of manufacture of such a radiator.

In accordance with the present invention there is provided a ring radiator for a loudspeaker, comprising a radiating element having annular inner and outer portions, and a former carrying a coil and positioned radially substantially at the junction of said inner and outer portions, wherein said former is integral with at least one of said inner and outer portions.

In a preferred embodiment of the invention, the coil former is formed integrally with one of said inner and outer portions and the other said portion is secured to said one portion, preferably by an adhesive lap joint.

Preferably, the element which constitutes the coil former is provided with a circumferential lip or return at the end remote from the radiating element, in order to prevent the coil turns from becoming detached.

Also, in accordance with the present invention there is provided a method of making a ring radiator for a loudspeaker which comprises the steps of producing a tubular former integrally with at least a portion of an

annular radiating element, and thereafter winding a coil on said former.

In the preferred method in which the former is integral with just one portion of the annular radiating element, the coil is wound on the former and then the wound component is secured to a further portion of the radiating element, for example by means of an adhesive lap joint.

The method of construction in accordance with the present invention, and the product produced thereby, has considerable advantages as compared with the conventional arrangement. The ring radiator of the present invention is tough and robust, and is much less liable to damage than the conventional radiator. Additionally, because of the direct coupling of the coil to the radiating element one achieves a much smoother response, without the undesirable resonances which characterise conventional ring radiators. Furthermore, the winding of the coil is greatly simplified with the form of construction of the present invention, resulting in more consistent performance, less wastage, and ease of handling with automated assembly machinery.

The ring radiator of the present invention is particularly suitable for loudspeakers which operate within a frequency range of 2KHz to 16 KHz, although these frequencies are not to be taken as being limiting frequencies.

In order that the invention may be fully understood, one preferred embodiment of ring radiator in accordance with the invention will now be described by way of example and with reference to the accompanying drawings, in which:

Fig. 1 is a schematic view, taken as a section through one side of the ring, of a known construction of ring radiator; and,

Fig. 2 is a view, similar to Fig. 1, of a ring radiator in accordance with the invention.

A conventional construction of a ring radiator is shown in Figure 1 of the drawings which is a schematic sectional view through just one side of the ring radiator, the section through the diametrically opposite side being the same. In this construction, the diaphragm element 10 is formed as an annulus having generally horizontal inner and outer webs 10a and 10b respectively and a substantially V-shaped valley zone. The inner and outer webs 10a and 10b are rigidly clamped by support washers 12. A separate tubular former 14 carries the coil windings 16. Conventional practice has been to secure the wound former to the apex of the valley zone of the diaphragm 10 by means of an adhesive using a butt joint as indicated at 18. In order to improve the adhesion, the tubular former 14 is sometimes provided with a tongue, indicated in broken lines at 20, to provide an increased surface area for adhesive contact with the diaphragm 10.

Referring now to Figure 2, it will be seen that the annular radiator here comprises an outer annular portion 22, and an inner annular portion 24. Clamping washers 26 are shown for each radiator portion, but these are optional. The outer annular portion 22 comprises a horizontal web or limb 22a, a sloping limb 22b and an upturned tongue 22c. The inner annular portion 24 comprises a horizontal limb 24a, a sloping limb 24b, and, integrally therewith, a portion 24c which constitutes a tubular former for the windings of a coil 28. The tubular portion 24c has a flange or return 24d which serves as a seat for one end of the coil windings to prevent turns of the coil from becoming detached.

In manufacture, the one annular radiator portion 24 is first produced by a suitable shaping process. The

coil 28 is then wound on that element 24, using the flange 24d as a stop. The other, outer annular portion 22 of the radiator is then presented to the wound element so that the tongue 22c makes a lap joint with the face of the sloping limb 24b of the element 24. A suitable adhesive is used between the two parts to give a strong joint. It will be appreciated that because one has surface-to-surface contact here, as compared with point contact in many of the conventional arrangements, one can achieve much better adhesion and a more reliable joint.

The material of the ring radiator of the present invention may be any suitable material, for example bakelised cloth, aluminium, a plastics material, etc.

Although in the preferred embodiment described above the portion 24c which constitutes the former on which the coil is wound is integral with the radially inner portion of the radiator, it could alternatively be made integral with the radially outer portion 22 of the radiator. Alternatively, it could be made integral with both portions 22 and 24 of the radiator, in which case no separate jointing steps would be necessary.

CLAIMS:

1. A ring radiator for a loudspeaker, comprising a radiating element having annular inner and outer portions, and a former carrying a coil and positioned radially substantially at the junction of said inner and outer portions, characterised in that the former (24c) is integral with at least one of said inner and outer portions (22,24).

2. A ring radiator as claimed in claim 1, characterised in that the former (24c) is integral with one (24) of said inner and outer portions, and the other said portion (22) is secured to said one portion by an adhesive joint.

3. A ring radiator as claimed in claim 2, characterised in that the joint is a lap joint providing surface-to-surface contact between an annular tongue (22c) on said other portion (22) and an annular surface on said one portion (24).

4. A ring radiator as claimed in any preceding claim, characterised in that the former (24c) is tubular and is provided with a circumferential lip (24d) at the end remote from the radiating element.

5. A ring radiator as claimed in any preceding claim, characterised in that said inner and outer portions of the radiating element each comprise a flat web portion (22a, 24a) and a sloping web portion (22b, 24b) with said sloping web portions defining a substantially V-shaped valley at the bottom of which the former (24c) is located.

6. A method of making a ring radiator for a loudspeaker which comprises the steps of producing a tubular former (24c) integrally with at least a portion of an annular radiating element, and thereafter winding a coil (28) on said former.

7. A method as claimed in claim 6, characterised

by making the former (24c) integrally with one annular portion of the radiating element, then winding the coil (28) on the former, and thereafter securing the wound component to a further annular portion (22) of the radiating element.

8. A method as claimed in claim 7, characterised inthat the wound component is secured to said further portion (22) by an adhesive lap joint.

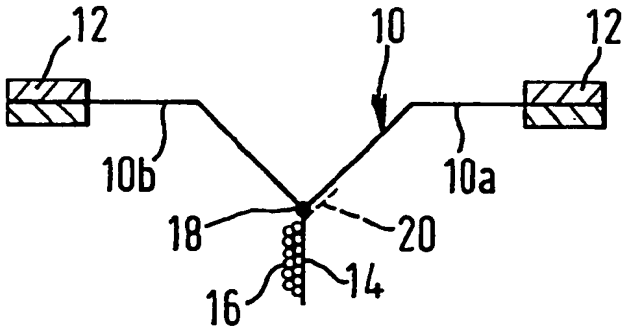

FIG.1. (PRIOR ART)

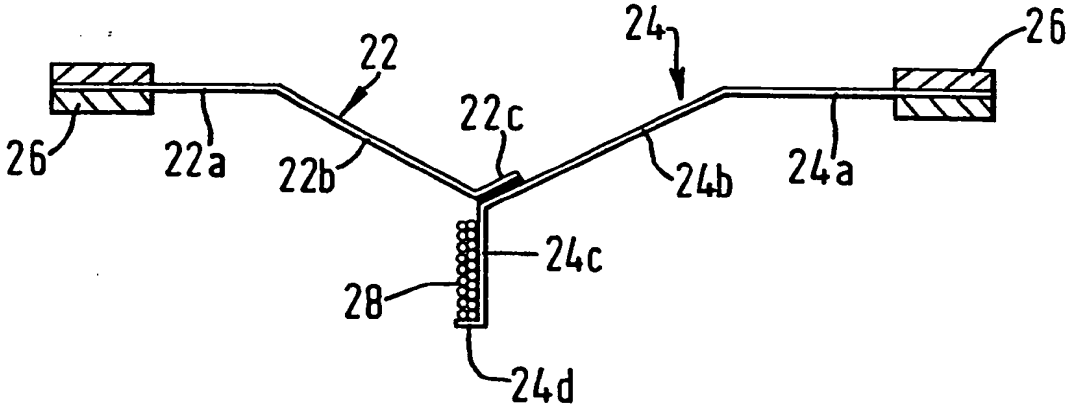

FIG.2.